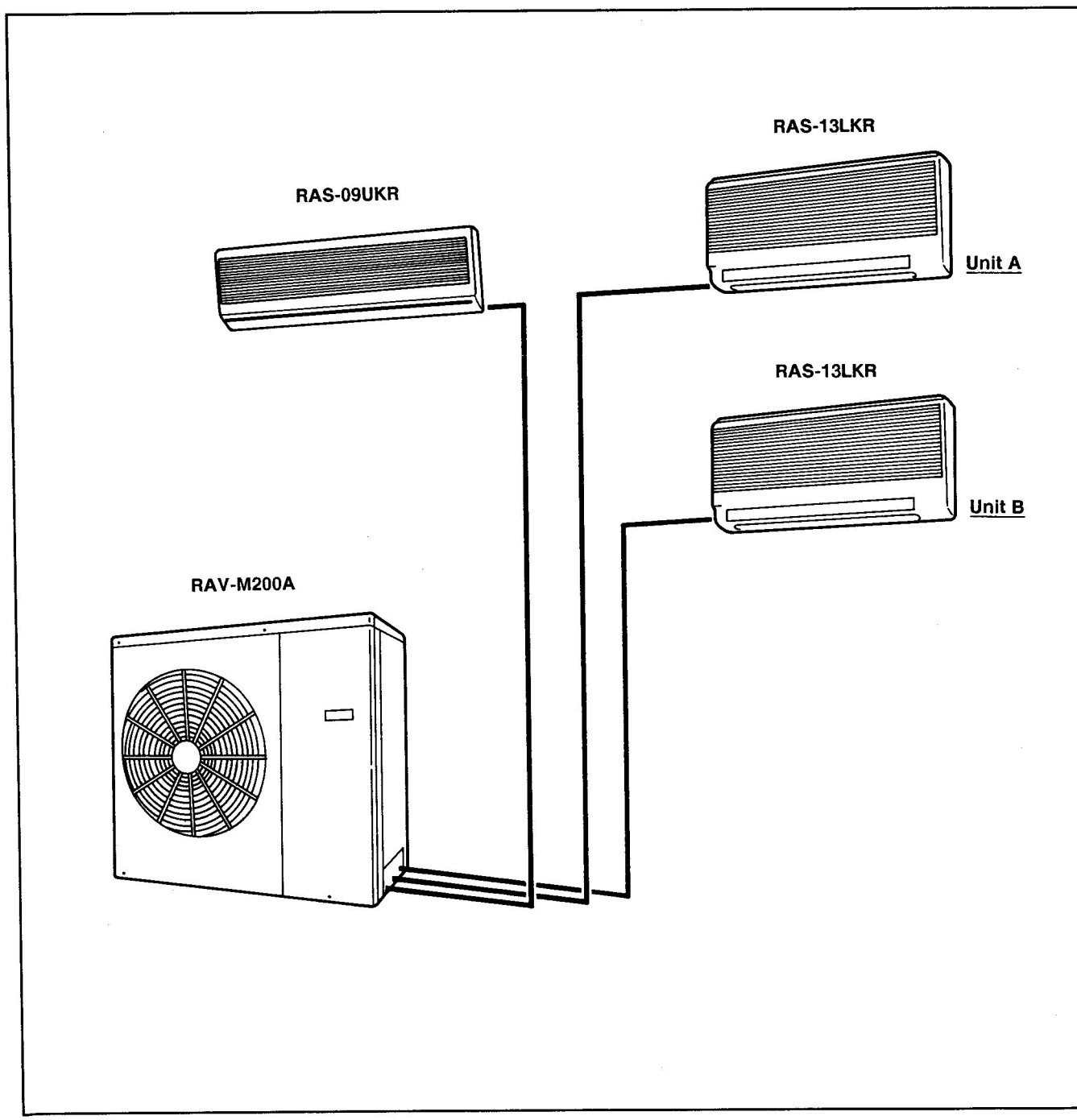
SERVICE DATA
FILE NO. 300-940

TOSHIBA

ROOM AIR-CONDITIONER

RAV-M200A (Combination with RAS-09UKR RAS-13LKR)



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1. SPECIFICATIONS

ITEM			MODEL	RAV-M200A								
Operation				1 indoor unit		2 indoor unit				3 indoor unit		
			Unit	1	A or B	1	A	B	1	A or B	1	A	B
		*1	BTU/h	7000	13000	—	6500	6500	7000	13000	7000	6500	6500
Cooling capacity			kcal/h	1750	3250	3250			5000		5000		
		*1	BTU/h	7000	13000	13000			20000		20000		
			kW	2.0	3.8	3.8			5.8		5.8		
Power source			Phase	1									
			V	220/240									
			Hz	50									
Power consumption	Cooling		kW	0.78	1.18	1.22			1.86		1.9		
Power factor	Cooling		%	94.2	98.6	98.2			97.4		97.0		
Running current	Cooling		A	3.6	5.2	5.4			8.3		8.5		
Starting current	Cooling		A	20	33	33			58		58		
Operating noise (SPL)			dB(A)	53									
Refrigerant	Name of refrigerant			R-22									
	Charge volume		kg	0.55 (1HP. UNIT), 0.95 (1.5HP. UNIT)									
Refrigerant control				Capillary tube									
Interconnection pipe	Gas side size		mm (in.)	9.5 (3/8") (1HP. UNIT), 12.7 (1/2") (1.5HP UNIT)									
	Coupler style			Flare									
	Liquid side size		mm (in.)	6.4 (1/4")									
	Coupler style			Flare									
	Standard length		m (ft)	7.6 (25)									
	Maximum length (of one way)	*3	m (ft)	10 (32) (1HP. UNIT),		A + B < 15m, A–B < 8m, A or B < 10m, (1.5HP UNIT)							
	Minimum length		m (ft)	2 (7)									
Maximum height	Indoor unit higher		m (ft)	5 (16)									
	Outdoor unit higher		m (ft)	5 (16)									
INDOOR UNIT Model				Unit 1 : 1HP UNIT : **RAS-09UKR**, SERVICE DATA FILE NO. 300-900 UNIT A, B : 1.5HP UNIT : **RAS-13LKR**, SERVICE DATA FILE NO. 300-820									
OUTDOOR UNIT Model				**RAV-M200A**									
Dimensions	Height		mm (ft-in.)	740 (29.13")									
	Width		mm (ft-in.)	880 (34.64")									
	Depth		mm (ft-in.)	310 (12.2")									
Net weight			kg (lbs)	62 (136.8)									
Condenser type				Finned tube									
Condenser fan type				Propeller fan									
Fan motor output			W	39									
Compressor	Model			PH94X1-4C3					PH150X2-4L				
	Output		W	750					1100				
Safety device				Fuse Inner overload relay									

Specifications are subject to change without notice.

Note 1: Cooling capacity is based on the following temperature conditions. [Condition A]
Evaporator air inlet temperature: 27°C DB (80°F DB), 19.5°C WB (67°F WB)
Condenser air inlet temperature: 35°C DB (95°F DB)

Note 2: Cooling capacity is based on the following temperature conditions. [Condition B]
Evaporator air inlet temperature: 29°C DB (88°F DB), 19°C WB (66°F WB)
Condenser air inlet temperature: 46°C DB (115°F DB)

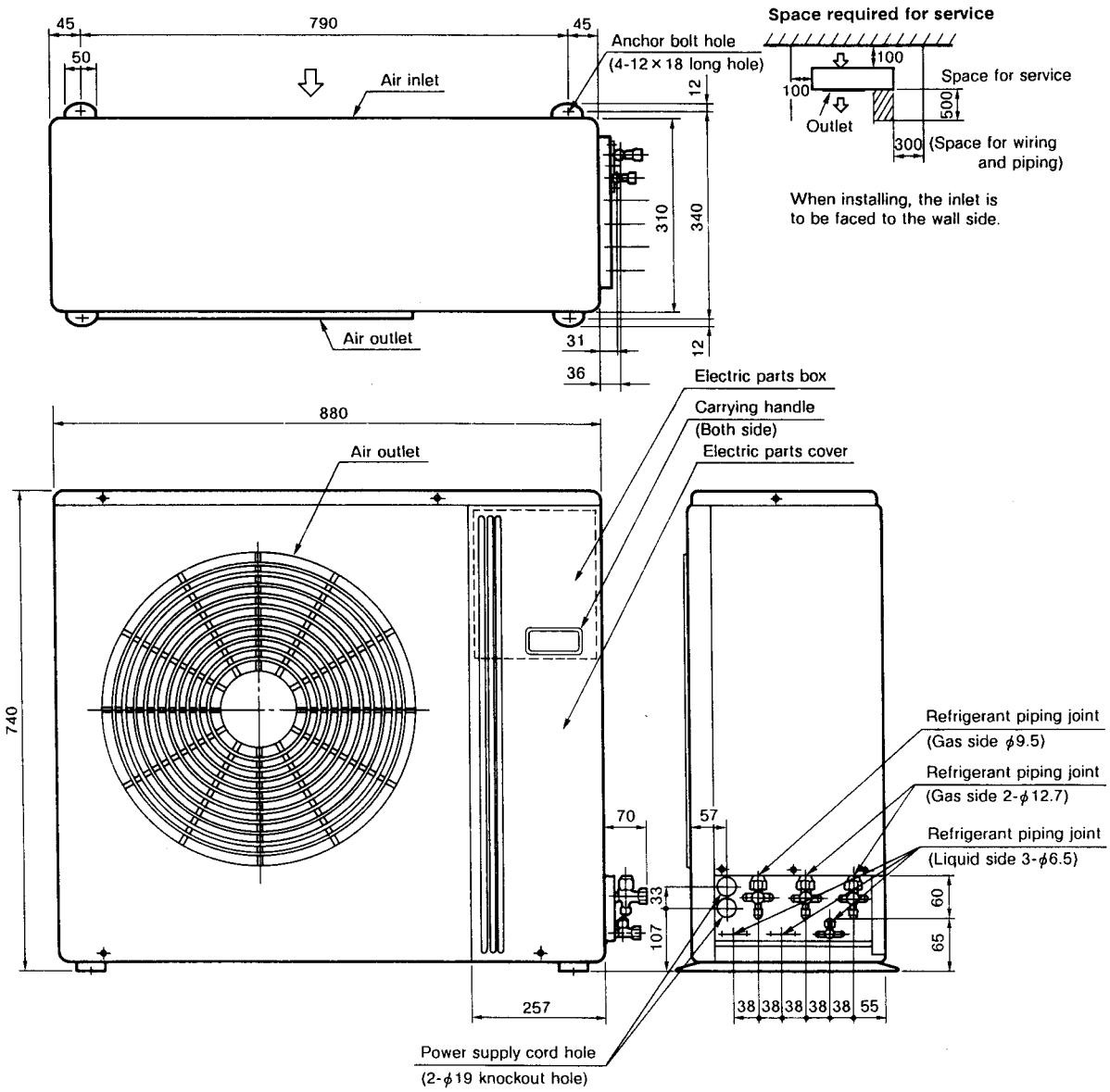
Note 3: These mean equivalent length.

Note 4: Operating range of the units
Evaporator air inlet temperature
Maximum 32°C DB, 22.5°C WB (95°F DB, 73°F WB)
Minimum 21°C DB, 15.5°C WB (70°F DB, 60°F WB)

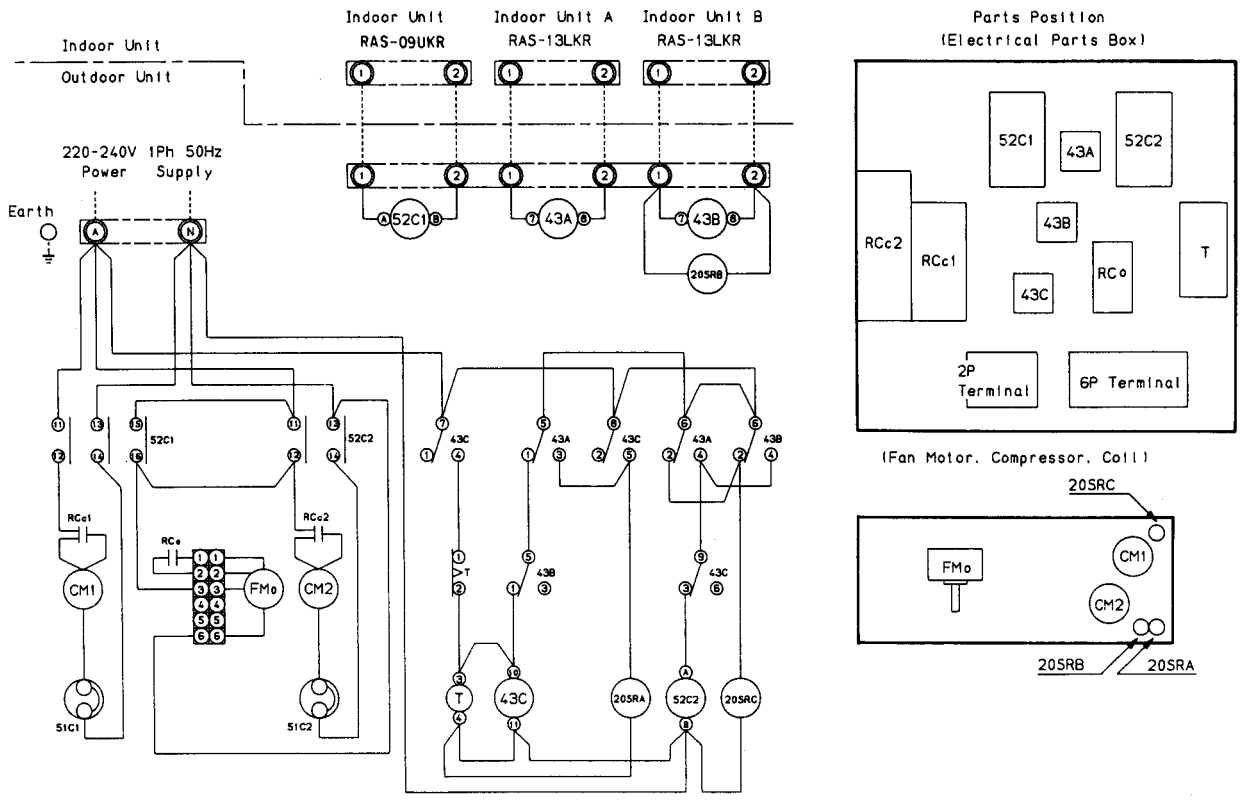
Condenser air inlet temperature
Maximum 52°C DB (126°F DB)
Minimum 21°C DB (70°F DB)

2. CONSTRUCTION VIEWS

Outdoor Unit
RAV-M200A



3. WIRING DIAGRAM



◎ shows terminal block and figures show terminal numbers. Broken lines show wiring at site.

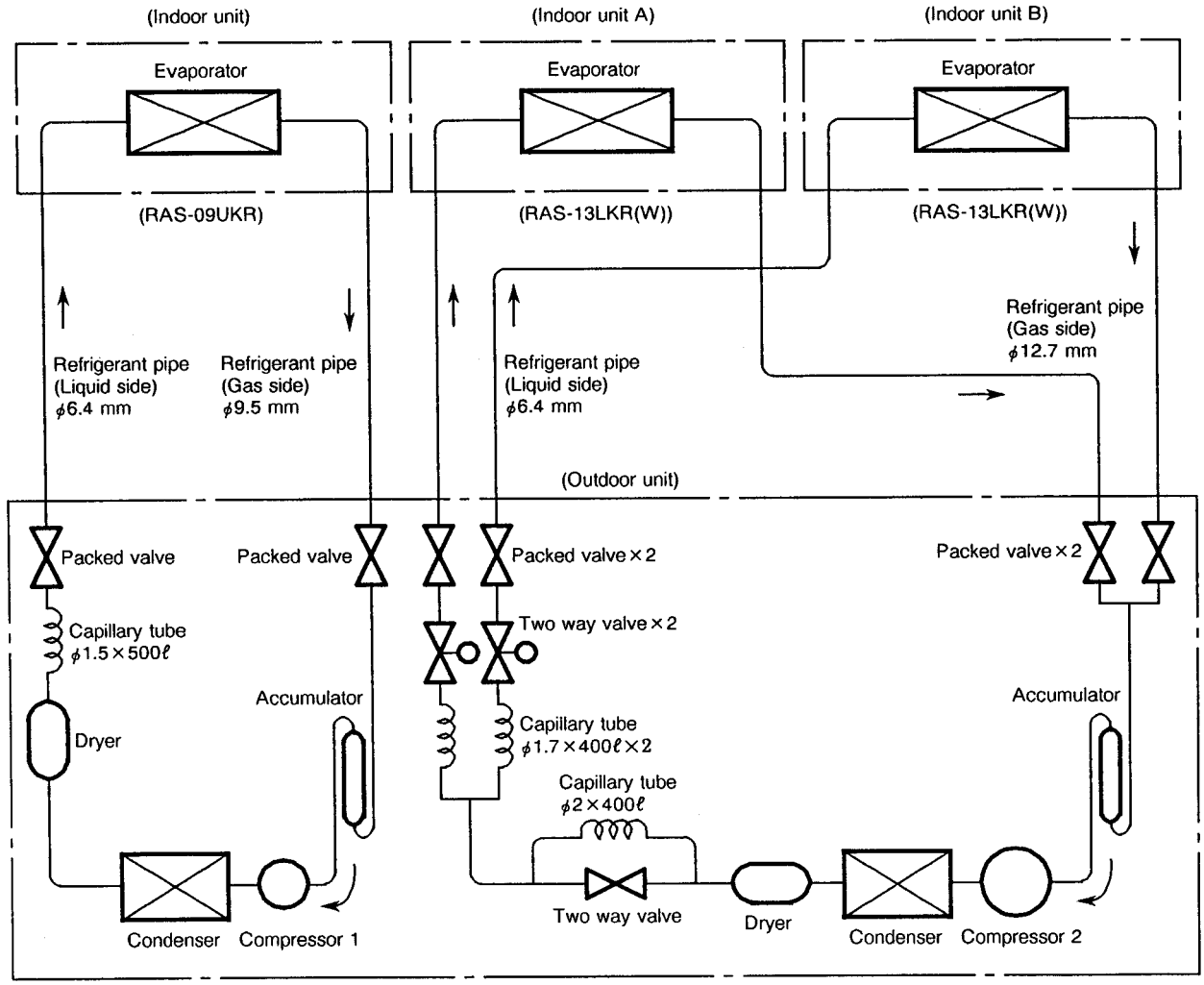
Don't operate the units with the magnetic contactor pushed.

Symbol	Name	Symbol	Name	Symbol	Name
CM1, 2	Compressor	RCo	Running Capacitor (Fan Motor)	43A, B, C	Relay
FMo	Fan Motor	51C1, 2	Overload Relay	20SRA, B, C	Solenoid Coil
RCc1, 2	Running Capacitor (Compressor)	52C1, 2	Magnetic Contactor	T	Thermal Timer

4. SPECIFICATIONS OF ELECTRICAL PARTS

PARTS NAME	TYPE	SPECIFICATIONS
Compressor 1	PH94X1-4C3	Output 750W, 2 pole, 1ϕ, 220/240V, 50Hz Winding resistance: Main coil 4.55Ω, Aux. coil 8.55Ω
Compressor 2	PH150X2-4L	Output 1.1kW, 2 pole, 1ϕ, 220/240V, 50Hz Winding resistance: Main coil 2.2Ω, Aux. coil 3.5Ω
Fan motor	AF-200-39R-2	Output 39W, 6 pole, 1ϕ, 230V, 50Hz
Magnetic contactor	VC20FA	AC240V
Capacitor	MT-40MP156W1	For compressor 1 : PH94X1-4C3, AC400V, 15μF
	MT-40MP356W	For compressor 2 : PH150X2-4L, AC400V, 35μF
	EEP2G355HQA114	For fan motor, AC400V, 3.5μF
Solenoid coil (2-way valve)	NEV AC240	AC220/240V
Relay	LY1F	Coil 220/240V, 50/60Hz
	LY2F	Coil 220/240V, 50/60Hz
	LY3F	Coil 230V, 50/60Hz
Thermal timer	230-B-180-4BFP	AC230V, 3-min. (Delay)

5. REFRIGERANT PIPING DIAGRAM



REFRIGERANT PIPING

Permissible Piping Length and Head

Model	Connectable indoor unit number	Permissible piping length	Difference pipe lengths (ℓ_2–ℓ_3)	Permissible piping head (H)	Between units A and B piping head (Δh)	Remarks
RAS-13LKR	2	15m ($\ell_2 + \ell_3$)	8m	5m	1m	Fig. 1
RAS-13LKR	1	10m (ℓ_1)	–	5m	–	Fig. 2
RAS-09UKR	1	10m (ℓ_1)	–	5m	–	Fig. 1 or 2

The minimum inter-unit refrigerant piping length shall be 2m.

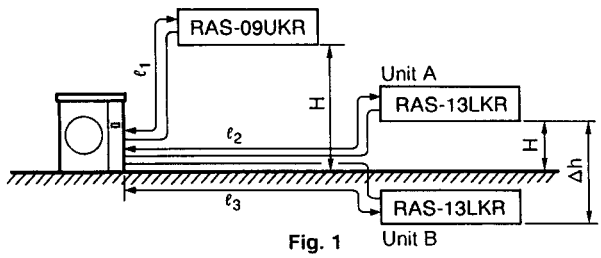


Fig. 1

Limit the number of bends in the refrigerant piping to 10 or less.

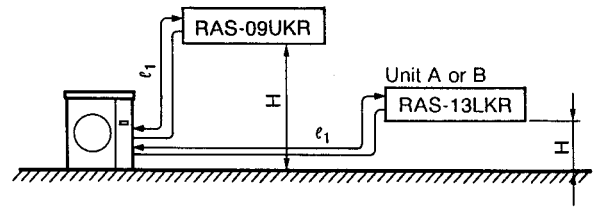


Fig. 2

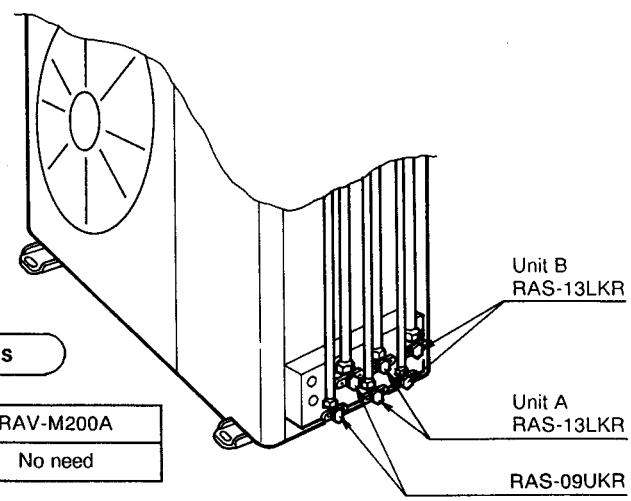
Piping Material and Sizes

Piping material		Phosphate deoxidized copper seamless pipes for air conditioners	
Model		RAS-13LKR	RAS-09UKR
Piping size (mm)	Larger	12.7	9.5
	Smaller	6.4	6.4

Air Purging

- Subject the refrigerate tube of outdoor and indoor units to air purge with a vacuum pump.
- Do not carry out this air purge by using the refrigerant filled in the outdoor unit.
- To handle valves, a 5mm hexagon wrench is needed.

Piping Material and Sizes



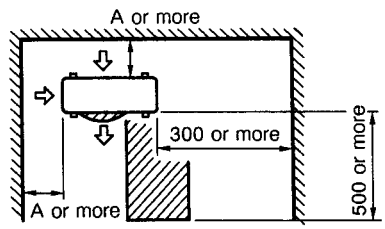
Additional Refrigerant Quantities

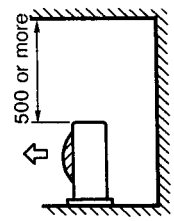
Model	RAV-M200A
Addition per meter	No need

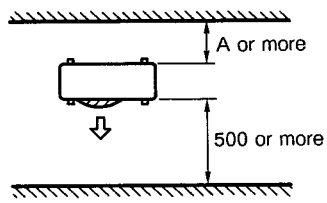
6. UNIT INSTALLATION

Service Space

Ensure that there is sufficient space around the outdoor unit for installation and servicing.

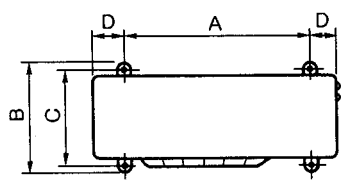


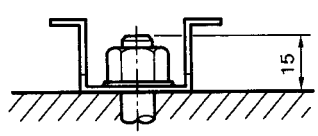




Model (RAV-)	A (mm)
All units other than those listed below	150
M200A	100

- Do not install in a place that can increase the vibration and amplify the noise level of the units.
- Be sure to fix the outdoor unit with four (4) M10 anchor bolts according to foundation drawings below.





Model (RAV-)	A	B	C	D
M200A	790	364	340	45

7. OPERATIONAL MATRIX OF ELECTRICAL PARTS

Operation \ Parts		K7	52C1	CM1	FMo	K7A	K7B	43A	43B	43C	52C2	CM2	20SR A	20SR B	20SR C	T
RAV-M200A	Power ON	×	×	×	×	×	×	×	×	○	×	×	○	×	○	○
RAS-09UKR	Cooling operation	○	○	○	○	×	×	×	×	○	×	×	○	×	○	○
RAS-09UKR	Thermo OFF	×	×	×	×	×	×	×	×	○	×	×	○	×	○	○
Unit A	Cooling operation	–	–	–	○	○	×	○	×	×	○	○	○	×	○	×
Unit A	Thermo OFF	–	–	–	×	×	×	×	×	○	×	×	○	×	○	○
Unit B	Cooling operation	–	–	–	×	×	○	×	○	○	×	×	○	○	×	○
After T (① & ② open)		–	–	–	○	×	○	×	○	×	○	○	×	○	×	×
Unit B	Thermo OFF	–	–	–	×	×	×	×	×	○	×	×	○	×	○	○
Unit A, B	Thermo ON	–	–	–	○	○	○	○	○	×	○	○	○	○	×	×

* After T (① & ② open)

K7, K7A, K7B : Indoor unit cooling operation relay output
52C1, 52C2 : Compressor MG-SW
FMo : Outdoor unit fan motor
CM1, CM2 : 1HP compressor, 1.5HP compressor
43A : RAS-13LKR A unit cooling operation relay
43B : RAS-13LKR B unit cooling operation relay
43C : A, B units start delay relay
T : Thermal timer
20SR A : RAS-13LKR A unit changeover 2-way valve solenoid coil
20SR B : RAS-13LKR B unit changeover 2-way valve solenoid coil
20SR C : A, B units 2-way valve solenoid coil, OFF at the time of simultaneous operation

○ : Activation
× : Inactivation
– : Ignore

8. TROUBLESHOOTING CHART FOR RAS-13LKR/RAV-M200A

	Troubleshooting procedures
1	Following the details of "What to be prechecked first", make sure of the basic items.
2	When there is not trouble corresponding to the items in "1" above, check in detail the faulty parts following "How to judge faulty parts by symptoms" later.

1. WHAT TO BE PRECHECKED FIRST:

1.1 Power voltage

The power voltage must be from AC 198V to 264V. If the power voltage is not within this range, the air-conditioner may not work normally.

1.2 Incorrect cable connection between indoor and out-door units.

The indoor unit is connected to the outdoor unit with 2 cables. Make certain that the terminals of indoor and outdoor connectors have been connected properly by the same numbers. If not connected as specified, the outdoor unit won't operate normally.

1.3 Operations not regarded as failure (program operation)

In terms of the control of air-conditioner, the operations shown in Table below are made as a program operation incorporated in a micro-computer. If a claim is made about the operation, check it corresponds to the contents in Table. If it does, it is an indispensable operation for the control and maintenance of the air-conditioner but not a failure of the units.

- **Operations which are not deemed trouble**

No.	Operation of Air-Conditioner	Description
1	When the POWER plug socket of the indoor unit is inserted, the operation lamp flashes.	The operation lamp flashes, indicating that power is turned on. If this happens, press the ON/OFF button once, and flash will stop. Power failure also causes the same lamp to flash.
2	Room temperature is in the range under which the compressor is turned on, but the compressor will not start.	The compressor will not start while the compressor restart prevention timer (three-minute timer) is actuated. This applies also when power is turned on.
3	Fan speed remains unchanged when the fan speed button is operate in the dry mode.	Fan speed is fixed at Low in the Dry mode.
4	The indoor fan occasionally stops intermittently in the Dry mode.	In the dry mode operation of the indoor Fan is synchronized with the compressor. As a result the indoor fan is stopped when the compressor is stopped.
5	The compressor will not switch on or off even when the thermo control is operated in the dry mode.	In the dry mode, the compressor goes on and off at regular intervals, independent of the Thermo control.

2. PRIMARY JUDGMENT OF TROUBLE SOURCES

2.1 Role of indoor unit controller

The indoor unit controller receives the operation commands from the remote control and assumes the following functions.

- Measurement of the draft air temperature of the indoor heat exchanger by using the thermo sensor
- Louver motor control
- Control of the indoor fan motor operation
- Control of the LED display
- Control of the outdoor unit compressor and the outdoor fan motor

2.2 Display of abnormalities and judgment of the abnormal spots

The indoor unit of this machine observes the operation condition of the air conditioner and displays the contents of the self diagnosis as block displays on the display panel of the indoor unit.

	BLOCK DISPLAY	CHECK CODE	SELF DIAGNOSIS	CHECK CODE
A	Operation Display Flashing (1 Hz)	–	Power Failure (When power is on)	–
B	Operation Display Flashing (5 Hz)	00	Abnormality in the Thermo Sensor	00
C	Operation Display Flashing (5 Hz)	00	Indoor Fan Motor is Locked	11
D	Operation Display Flashing (5 Hz)	00	Power Photocoupler is Short-circuited	11
E	Operation and Timer Display Flashing	01	Thermal Fuse is Blown	04
F	Goes out a few Seconds after Plug Insertion	–	Incorrect Voltage is Applied or other	–

2.2.1 Judgment from defective operation or abnormal operation

NO.	SYSTEM	CHECK		PRIMARY JUDGMENT
1.	No reaction on remote control operation	Turn off the power once, turn it on again and try to operate the remote control again.	① Remote control is not possible.	The Indoor part (including the remote control) is defective.
			② Remote control is possible.	O.K.
2.	The outdoor fan does not rotate	① The compressor operates.		The outdoor part is defective (outdoor fun motor)
		② The compressor does not operate.		The inside part is defective. The outdoor part is defective.

2.2.2 Self-diagnosis by Remote Controller

With the indoor unit controller, self-diagnosis of protective circuit action can be done by turning the remote controller operation into service mode, operating the remote controller, observing the remote controller indicators and checking whether ON lamp flashes (5Hz).

1. How to select remote controller operation mode

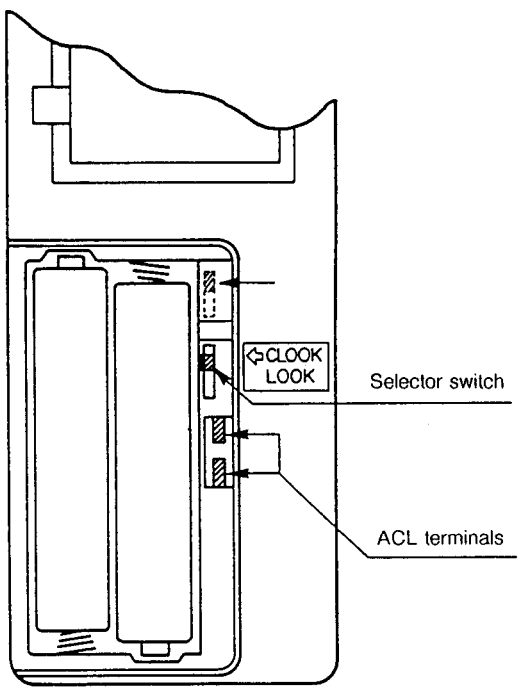
(1) Selecting service mode
Set selector switch beside the battery case of wireless remote controller to the service mode as shown in the figure below and short-circuit ACL (All Clear) terminals. Check 「 00 」 is indicated on the temperature display section and other indicators go off.

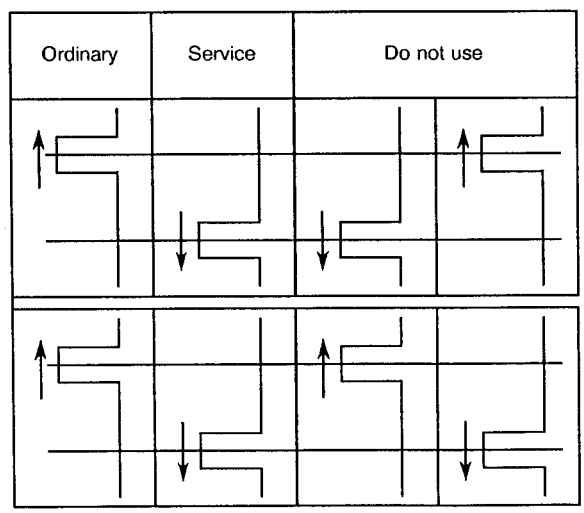
(2) Selecting ordinary mode
Set the above switch to ordinary mode as illustrated below, and short-circuit ACL (All Clear) terminals. At this point, make sure that all the indicators go off.

2. Cautions when doing service

(1) After finishing service, never fail to set the selector switch to the ordinary mode and short-circuit ACL (All Clear) terminals to get back into the ordinary mode.

(2) Normally, do not operate other switches than the service mode.





3. Self-diagnosis by check code

(1) Self-diagnosis by check code is carried out while the B-F block indication is being made.

(2) When switched to the service mode, remote controller key operation is done with "ON/OFF", "RESET/INDICATE" and "SET LOUVER". In doing this, operation of the keys gives indications on the remote controller as follows. (2-digit numerals are represented by hexadecimal.)

Operating key	Indication after operation
ON/OFF	00
SET LOUVER	+1 to the data before operation (Example) 02 → 03
RESET/INDICATE	–1 from the data before operation (Example) 02 → 01

(3) The following is the procedure for making self-diagnosis by check code:

1) Turn the remote controller into service mode and check that the remote controller's temperature indicator shows " 00 ".
2) Operate "ON/OFF" key and make sure that the timer indicator starts flashing (5Hz). During the self-diagnosis by check code, the timer indicator always flashes.
3) In this event, if the ON lamp flashes also, it can be known that protection circuit of indoor PC board is involved.
   If the ON lamp does not flash, you may confirm that the indoor PC board protective circuit is not in action.
4) As you operate "SET LOUVER" key, the remote control indication shows " 01 " for checking whether the ON lamp flashes or not. If the ON lamp flashes, you can confirm that the thermal fuse is blown out.
5) Get the +1 indications successively by operating "SET LOUVER" key for checking the contents of the self-diagnosis as shown in the table below. It is to be noted that " 00 " to " 03 " are for checking the presence or absence of the action of protection circuit for each block, while " 04 " to " 1F " are for checking whether typical protective circuit actions are involved in the symptom.

3. TROUBLESHOOTING FLOWCHARTS

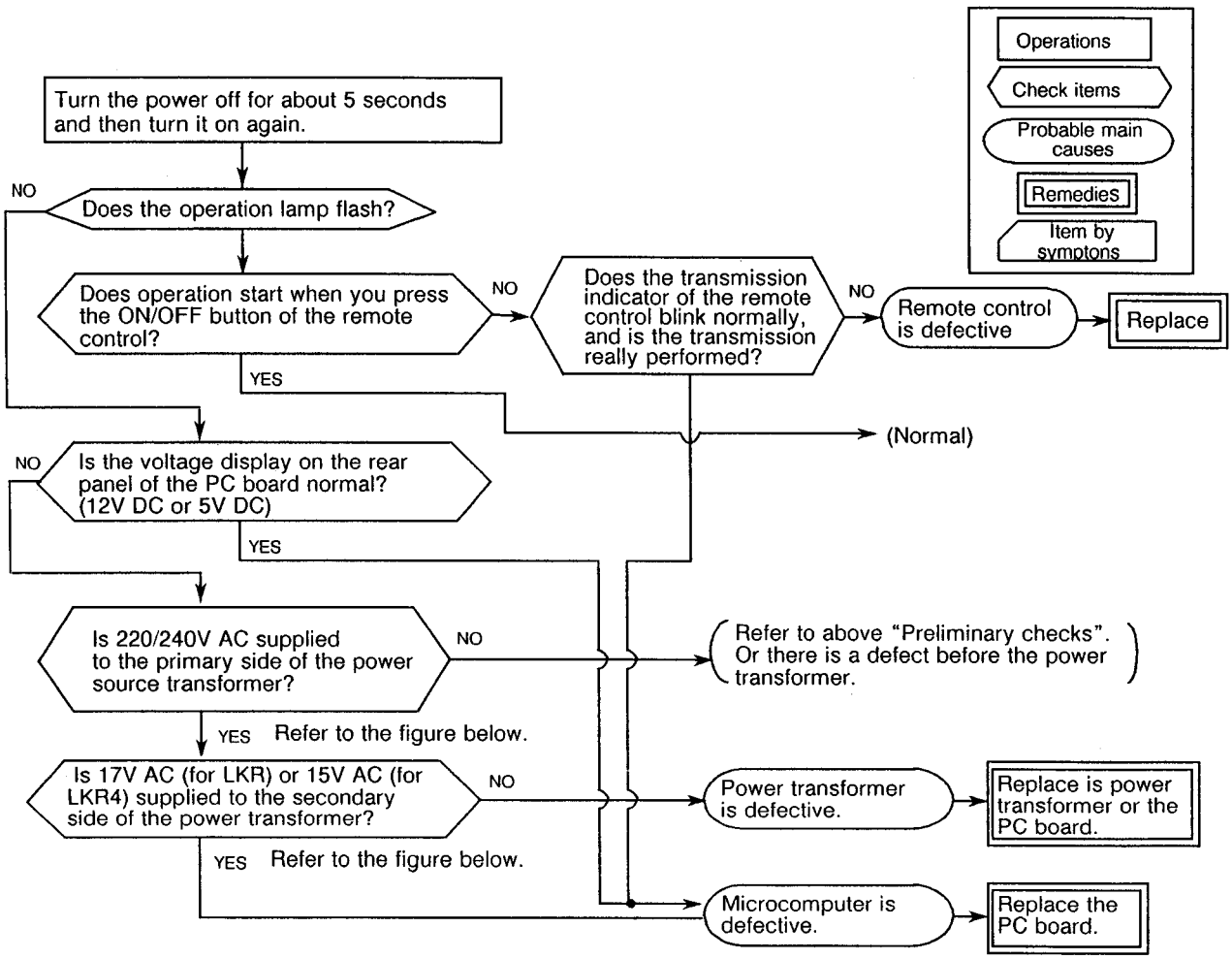
3.1 Power cannot be turned on (No operation at all)

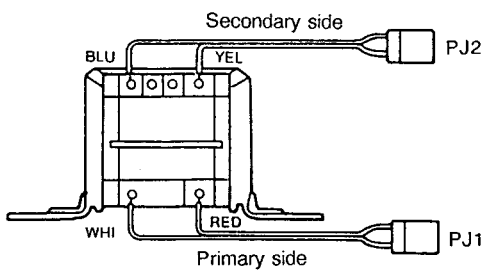
<Preliminary Checks>

① Is the supply voltage normal?

② Is the connection to the AC output O.K.?

③ Are the connection of the primary side and the secondary side of the power transformer inserted into the PC board?


Operations
Check items
Probable main causes
Remedies
Item by symptons
Turn the power off for about 5 seconds and then turn it on again.
NO
Does the operation lamp flash?
Does operation start when you press the ON/OFF button of the remote control?
NO
Does the transmission indicator of the remote control blink normally, and is the transmission really performed?
NO
Remote control is defective
Replace
YES
(Normal)
NO
Is the voltage display on the rear panel of the PC board normal? (12V DC or 5V DC)
YES
Is 220/240V AC supplied to the primary side of the power source transformer?
NO
Refer to above "Preliminary checks". Or there is a defect before the power transformer.
YES Refer to the figure below.
Is 17V AC (for LKR) or 15V AC (for LKR4) supplied to the secondary side of the power transformer?
NO
Power transformer is defective.
Replace is power transformer or the PC board.
YES Refer to the figure below.
Microcomputer is defective.
Replace the PC board.



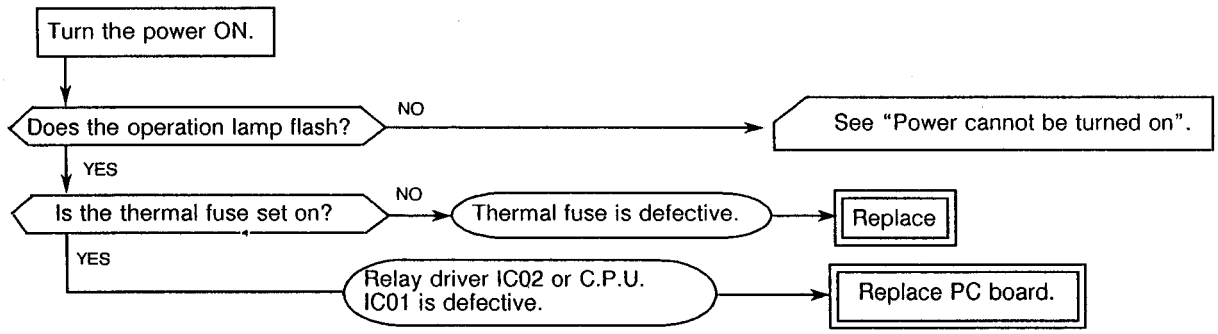
Color Identification

WHI:	WHITE
RED:	RED
BLU:	BLUE
YEL:	YELLOW

Power transformer connection diagram.

3.2 Relay K7 does not operate.

Louver is not controlleed automatically.



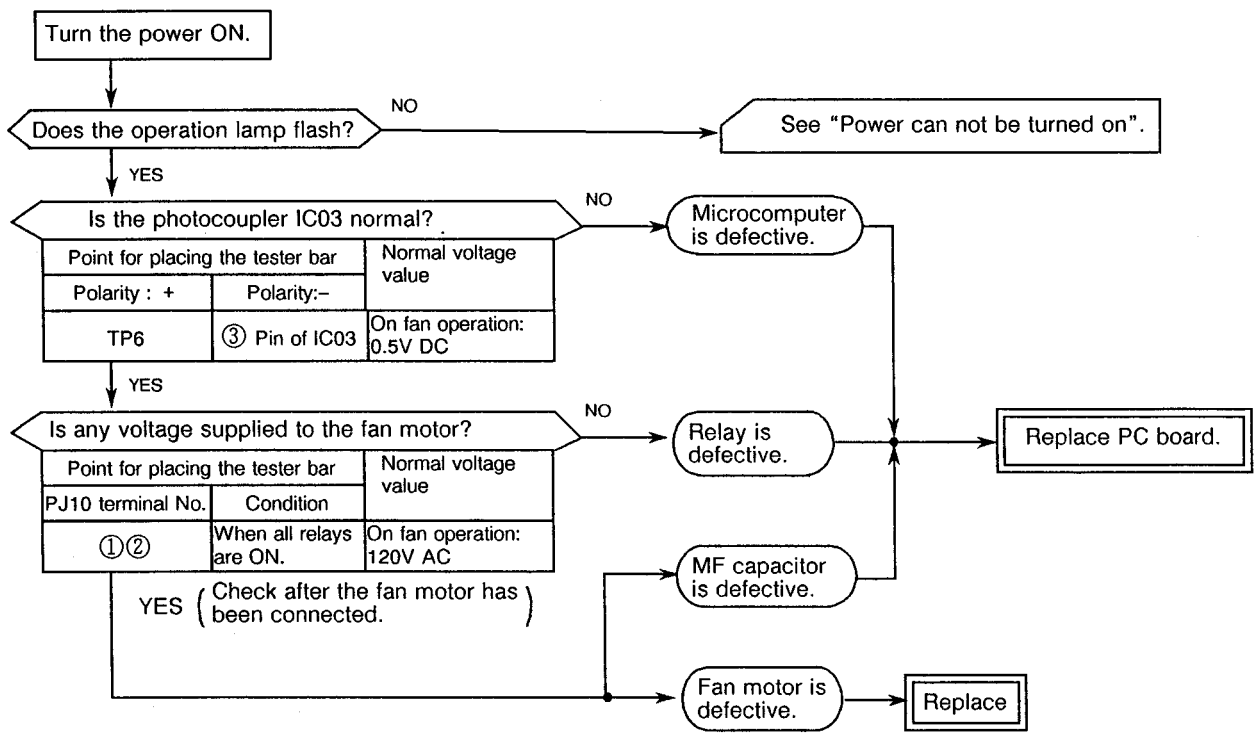
●When wiring to the thermal fuse has been broken, the timer lamp and operation lamp will flash with 5 Hz.

3.3 Only the indoor fan does not operate

< Preliminary checks >

Does it neither work in COOL or FAN ONLY operation?

< Checking procedure >



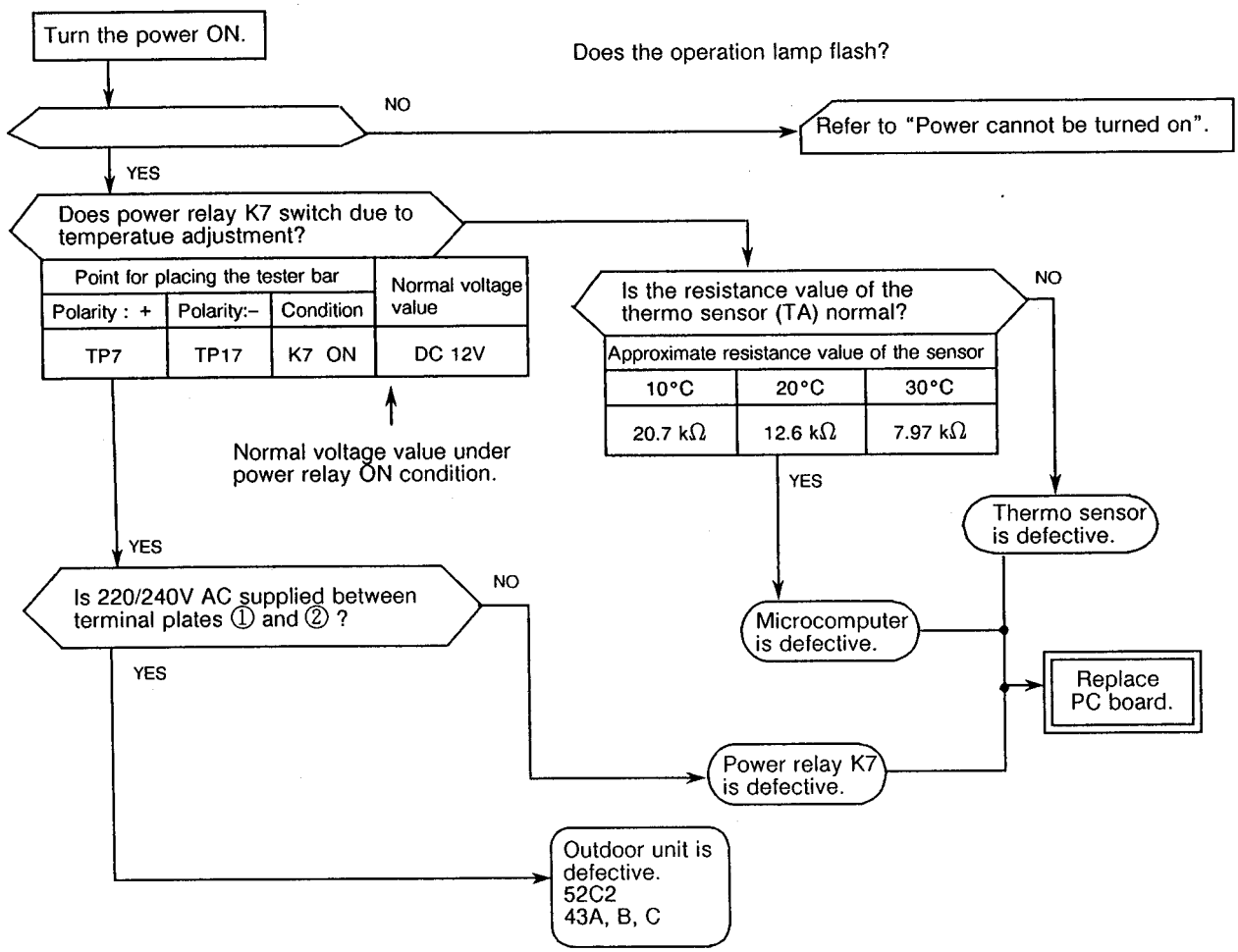
3.4 Compressor does not operate (Indoor fan also does not turn.)

< Preliminary checks >

① Is the temperature set on the remote control higher than the room temperature in cool operation?

② Is contact of the crossing wiring O.K.?

< Checking procedure >

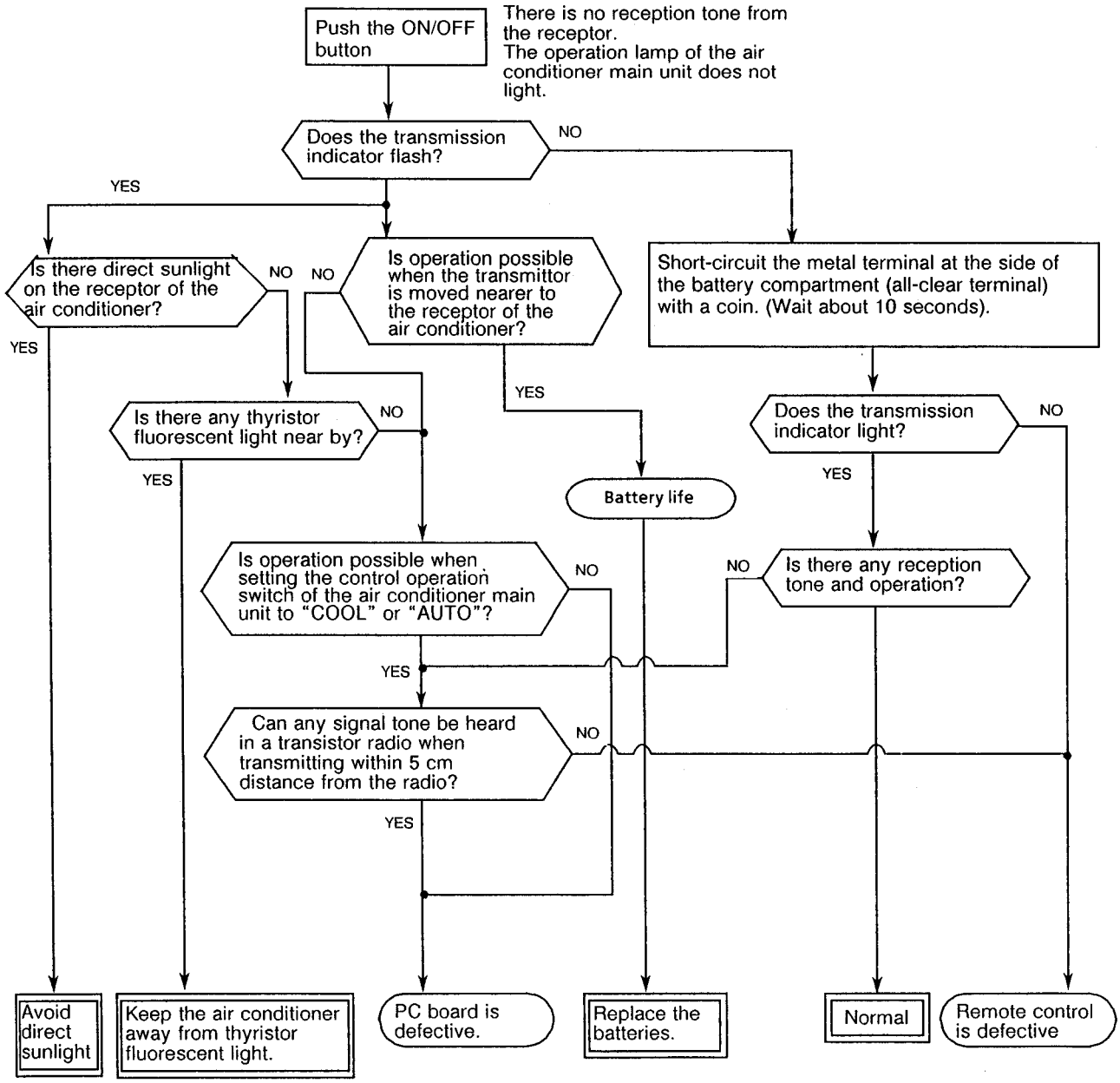


4. TEST POINTS ON THE PC BOARD AND LIST OF VOLTAGE VALUES

The test points (TP) are indicated on the rear of the PC board.
The voltage values on the test points for defect diagnosis items are listed below.

No.	Defect diagnosis item	Point for placing the tester bar			Normal voltage value
		Polarity (+)	Polarity (–)	Condition	
①	Does the power relay (K7) switch?	TP7	TP17	When relay K7 is ON.	12V DC (When relay is ON.)
②	Is the voltage of the secondary side of the transformer O.K.?	TP3	TP5	–	No load : 14±2V With load: 12±2V
③	Is the voltage of the primary side of the transformer O.K.?	P1	P2	–	220/240V AC
④	Are both PTH terminals 5V AC or less?	Either end of PTH		–	5V AC or less : normal 5V AC or more: abnormal

5. HOW TO CHECK THE REMOTE CONTROL (INCLUDING THE INDOOR PC BOARD)


Push the ON/OFF button
There is no reception tone from the receptor.
The operation lamp of the air conditioner main unit does not light.
Does the transmission indicator flash?
NO
YES
Is there direct sunlight on the receptor of the air conditioner?
NO
YES
Is operation possible when the transmittor is moved nearer to the receptor of the air conditioner?
NO
YES
Short-circuit the metal terminal at the side of the battery compartment (all-clear terminal) with a coin. (Wait about 10 seconds).
Is there any thyristor fluorescent light near by?
NO
YES
Does the transmission indicator light?
NO
YES
Battery life
Is operation possible when setting the control operation switch of the air conditioner main unit to "COOL" or "AUTO"?
NO
YES
Is there any reception tone and operation?
NO
Can any signal tone be heard in a transistor radio when transmitting within 5 cm distance from the radio?
NO
YES
Avoid direct sunlight
Keep the air conditioner away from thyristor fluorescent light.
PC board is defective.
Replace the batteries.
Normal
Remote control is defective

Note: After battery replacement, short-circuit the metal terminal at the side of the battery compartment (all-clear terminal) with a coin.

5.1 HOW TO CHECK THE PC BOARD

5.1.1 Operating precautions

① When removing the front panel or the PC board, be sure to disconnect the power plug from the AC outlet.
② When removing the PC board, hold the edge of the PC board and do not apply force to the parts.
③ When connecting or disconnecting the connectors on the PC board, hold the whole housing. Do not pull at the lead wire.

5.1.2 Inspection procedures

① When a PC board is judged to be defective, check for disconnection, burning, or discoloration of the copper foil pattern or this PC board.
② The PC board consists of the following 4 parts:

1. Main PC board part..... power relay, indoor fan motor drive circuit and control circuit, C.P.U. and peripheral circuits, buzzer drive circuit and buzzer.
2. Light receiving unit..... light receiving circuit
3. Display ..... LED
4. Switch PC board ..... wireless-control, forced auto or forced-cooling selection

Check the defects of the PC board following the list below.

5.1.3 Checking procedure

No.	Procedure	Check point (Symptom)	Trouble cause
①	Disconnect the power plug from the AC outlet and remove the PC board assembly from the electronic parts base. Remove the flat cable from the terminal plate.	Is the fuse blown?	① Application of shock voltage ② Short-circuit of the indoor fan motor
②	Remove the motor connector from "MOTOR". Turn the power ON. If the operation lamp flash (0.5 sec. ON, 0.5 sec. OFF), steps ①–③ in the right column are not necessary.	Check power supply voltage. ① Between TP1 and TP2 (220/240V AC) ② Between TP3 and TP5 (17V AC) ③ Between Q1 emitter and GND (5V DC) ④ Between Q3 emitter and GND (12V DC) ⑤ Between PJ11 ② pin and GND (12V DC)	① Defective power cord, power switch, fuse or line filter, or wrong wiring ② Defective power transformer ③ Defective power circuit or short-circuited load ④ Same as ③ ⑤ Thermal fuse operation
③	Push the ON/OFF button once to set in operation mode. (Do not set to the fan only or on-timer mode.)	Check power supply voltage. ① Power relay coil voltage (12V DC) (TP7, TP17 space) ② Between SL connectors 1 and 2	① Relay coil cable is broken, relay driver (IC02) is defective. ② Relay contact is defective, SL connector is defective.
④	Start operation by using the anti restart timer.	① All LEDs of the operation lamp, the timer lamp and the FAN ONLY lamp light up. ② After 3 seconds, normal display does not appear.	} Display is defective or defect in the 4P housing assembly.

No.	Procedure	Check point (Sympton)	Trouble cause
⑤	Push the ON/OFF button once to set in operation mode. 1. Setting the anti-restart timer 2. Cooling operation 3. Fan speed : AUTO 4. Set the temperature sufficiently lower than the room temperature. 5. Continuous operation	① The compressor does not operate. ② The operation lamp flashes.	① The temperature of the Indoor heat exchange unit is extremely low. ② Defective control PC board.
⑥	Connect the motor connector to "MOTOR" and turn the power ON. Start operation as follows: 1. Set the operation mode to "FAN ONLY". 2. Set the fan speed to "HIGH". 3. Continuous operation	① There is a voltage of 120V or more between the red and black motor connector leads. ② The motor does not rotate. (But the key operation of the remote control is accepted.) ③ Motor rotates but vibrates hard.	① Indoor fan motor is defective. ② Contact of the motor connector is defective. ③ Main PC board is defective.

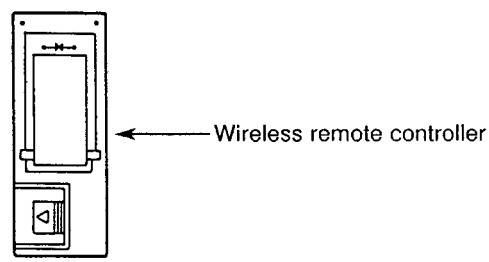
Approximate value of the sensor (thermistor) resistance

(≒ kΩ)

Temperature / Sensor	0°C	10°C	20°C	30°C
Thermo Sensor	35.8	20.7	12.6	8.0

5.2 How to reduce the operation time of the anti-restart timer

- Drill 2 holes on the rear of the wireless remote control unit.
  Attach the diode (IS1555 or equivalent) to the rivet inside the unit.
- Push the ON/OFF button to start operation with the diode attached.
  During operation, push the transmission/check button while the diode is attached.



9. TROUBLESHOOTING CHART FOR RAS-09UKR/RAV-M200A

	Troubleshooting procedures
1	Following the details of "What to be prechecked first", make sure of the basic items.
2	When there is not trouble corresponding to the items in "1" above, check in detail the faulty parts following "How to judge faulty parts by symptoms" later.

1. WHAT TO BE PRECHECKED FIRST:

1.1 Power voltage

The power voltage must be from AC 198V to 264V. If the power voltage is not within this range, the air-conditioner may not work normally.

1.2 Incorrect cable connection between indoor and outdoor units.

The indoor unit is connected to the outdoor unit with 2 cables. Make certain that the terminals of indoor and outdoor connectors have been connected properly by the same numbers. If not connected as specified, the outdoor unit won't operate normally.

1.3 Operations not regarded as failure (program operation)

In terms of the control of air-conditioner, the operations shown in Table below are made as a program operation incorporated in a micro-computer. If a claim is made about the operation, check it corresponds to the contents in Table. If it does, it is an indispensable operation for the control and maintenance of the air-conditioner but not a failure of the units.

- **Operations which are not deemed trouble**

No.	Operation of Air-Conditioner	Description
1	When the POWER plug socket of the indoor unit is inserted, the operation lamp flashes.	The operation lamp flashes, indicating that power is turned on. If this happens, press the ON/OFF button once, and flash will stop. Power failure also causes the same lamp to flash.
2	Room temperature is in the range under which the compressor is turned on, but the compressor will not start.	The compressor will not start while the compressor restart prevention timer (three-minute timer) is actuated. This applies also when power is turned on.
3	Fan speed remains unchanged when the fan speed button is operated in the dry mode.	Fan speed is fixed at Low in the dry mode.
4	Room temperature is in the range under which the compressor is turned off, but the compressor will not stop.	The compressor will not stop while the compressor on-hold timer (two-minute timer) is actuated.
5	The compressor will not switch on or off even when the thermo control is operated in the dry mode.	In the dry mode, the compressor goes on and off at regular intervals, independent of the Thermo control.

2. PRIMARY JUDGEMENT OF TROUBLE SOURCES

2.1 Role of indoor unit controller

The indoor unit controller receives the operation commands from the remote control and assumes the following functions.

- Measurement of the draft air temperature of the indoor heat exchanger by using the thermo sensor (TA).
- Louver motor control
- Control of the indoor fan motor operation
- Control of the LED display
- Control of the outdoor unit compressor and the outdoor fan motor

2.1.1 Judgement from defective operation or abnormal operation

NO.	SYSTEM	CHECK		PRIMARY JUDGEMENT
1.	No reaction on remote control operation	Turn off the power once, turn it on again and try to operate the remote control again.	① Remote control is not possible.	The Indoor part (including the remote control) is defective.
			② Remote control is possible.	O.K.
2.	The outdoor fan does not rotate	① The compressor operates.		The outdoor part is defective (outdoor fan motor)
		② The compressor does not operate.		The inside part is defective. The outdoor part is defective.

2.1.2 Self-diagnosis with remote controller

With the indoor unit controller, self-diagnosis of protective circuit action can be done by turning the remote controller operation into service mode, operating the remote controller, observing the remote controller indicators and checking whether ON lamp flashes (5Hz).

1. How to select remote controller operation mode

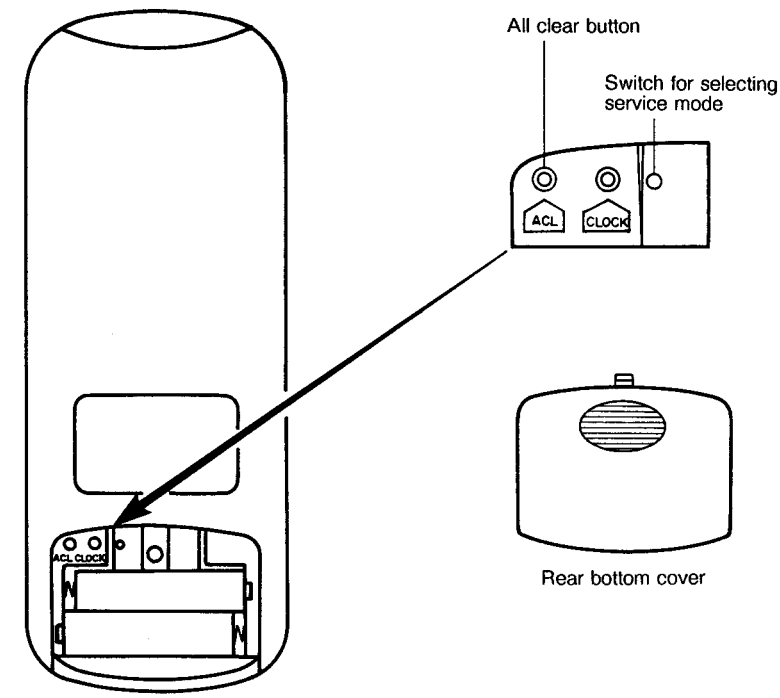
(1) Selecting service mode
Push the switch button provided on rear bottom of the wireless remote control with a tip of pencil for more than 3 seconds. Make sure the setting temperature " 88 " is displayed on the display and other display is turned off.

(2) Selecting ordinary mode
Push the all clear button (ACL) on the rear bottom of the wireless remote control with a tip of pencil for more than 3 seconds. Make sure the operation mode display, wind volume display, clock display and setting temperature display are turned on and " : " of the clock display is blinking.

2. Cautions when doing service

(1) After completion of servicing, always push the all clear (ACL) button to return the operation mode to the normal mode.

(2) After completion of servicing by the check code, turn off the power once and then turn on the power to reset memorized contents of the microcomputer to the initial status.



(Rear bottom of remote controller)

3. Self-diagnosis by check codes

(1) The self-diagnosis by the check codes is conducted under the block displays of item B-E.

(2) Remote control key operation under the service mode is conducted by ON/OFF or TEMP.
The remote control display by each key operation is varied as shown below. Two digit number is displayed in a hexadecimal number.

Operating key	Indication after operation
ON/OFF	" 00 "
TEMP. △ (Up)	1 is added to data before operation. (Example) " 02 " → " 03 "
TEMP. ▽ (Down)	1 is subtracted from data before operation. (Example) " 02 " → " 01 "
"AUTO" LOUVER	10 is subtracted from data before operation. (Example) " 02 " → " 12 "
"SET" LOUVER	Data before operation is directly transferred. (Example) " 02 " → " 02 "

(3) The self-diagnosis by the check codes is conducted with procedures shown below.

1) Enter the service mode and make sure the off timer display of the remote control shows " 00 ".
2) Operate the "ON/OFF" key and make sure the timer lamp on the display section is blinking (5Hz).
3) At the same time, also make sure the operation lamp is also blinking. This shows that the protection circuit on the indoor PC board is working.
4) Operate the TEMP. △ key and make sure the remote control display shows " 01 " and blinking of the operation lamp. If the operation lamp is blinking, it shows the protection circuits for ????? line and serial signal system is working.
5) In the same way, operate the TEMP. △ key so the display is incremented by +1 to continue checks by the self-diagnosis as shown in the table below. From " 00 " up to " 03 " check operations of protection circuits for each block, and " 04 " to " 0F " check operations of the typical protection circuits.

3.1 Display of abnormalities and judgement of the abnormal spots

The indoor unit of this machine observes the operation condition of the air conditioner and displays the contents of the self-diagnosis as block displays on the display panel of the indoor unit.

	BLOCK DISPLAY	CHECK CODE	SELF-DIAGNOSIS	CHECK CODE
A	Operation Display Flashing (1 Hz)	–	Power Failure (When power is on)	–
B	Operation Display Flashing (5 Hz)	00	Thermo Sensor (TA) Short/Break	0C
C	Operation Display Flashing (5 Hz)	00	Heat Exchanger Sensor (TC) Short/Break	0d
D	Operation Display Flashing (5 Hz)	00	Indoor Fan Lock Abnormality of Indoor Fan, IC03 Short/Break	11
E	Operation and Timer Display Flashing (5 Hz)	01	Thermal Fuse is Blown (Indoor Fan Motor is Overheat)	04

3. TROUBLESHOOTING FLOWCHARTS

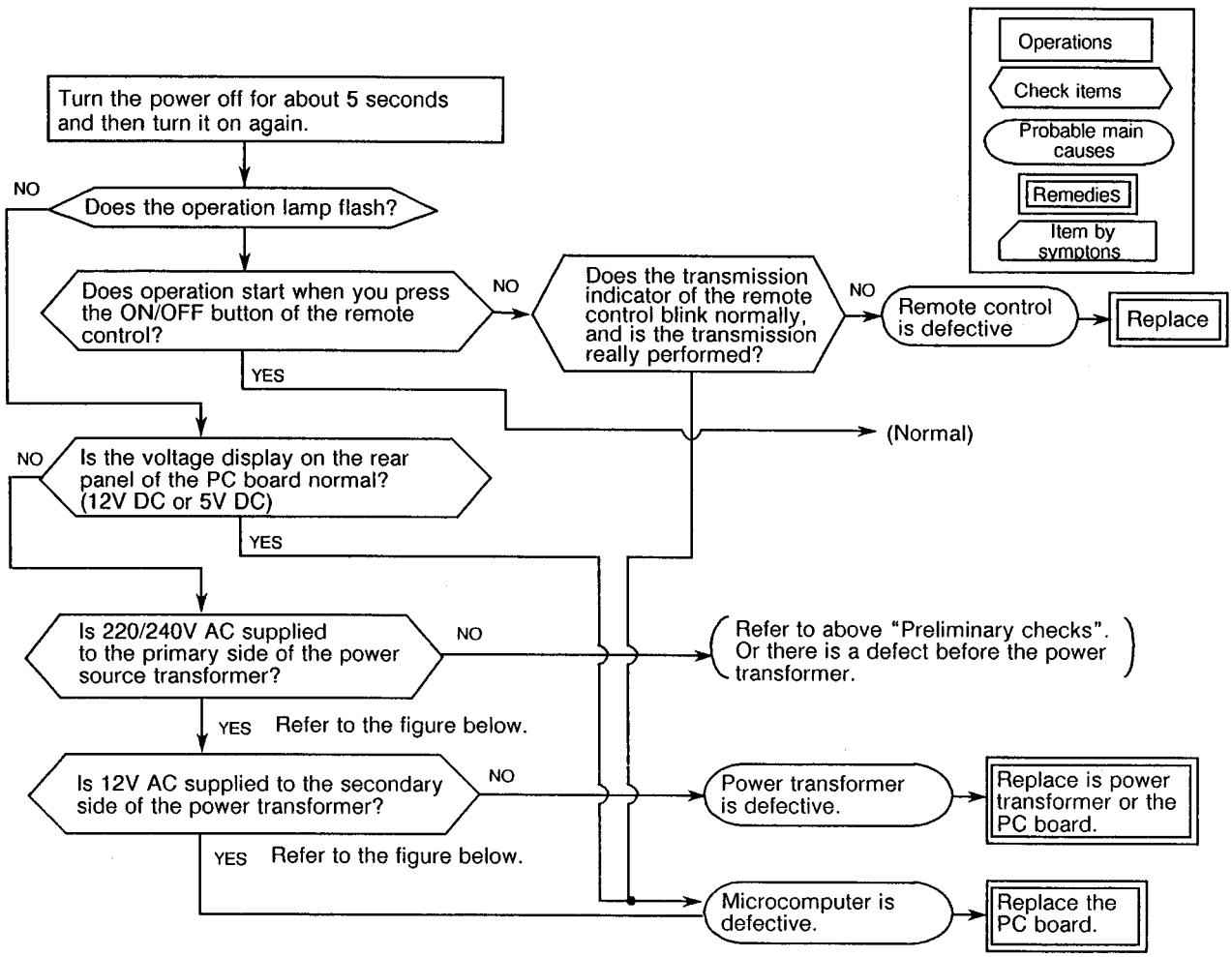
3.1 Power cannot be turned on (No operation at all)

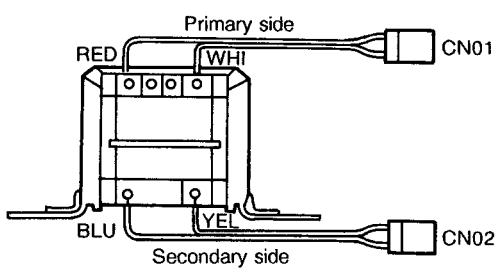
< Preliminary checks >

① Is the supply voltage normal?

② Is the connection to the AC output O.K.?

③ Are the connection of the primary side and the secondary side of the power transformer inserted into the PC board?


Operations
Check items
Probable main causes
Remedies
Item by symptons
Turn the power off for about 5 seconds and then turn it on again.
NO
Does the operation lamp flash?
Does operation start when you press the ON/OFF button of the remote control?
NO
Does the transmission indicator of the remote control blink normally, and is the transmission really performed?
NO
Remote control is defective
Replace
YES
(Normal)
NO
Is the voltage display on the rear panel of the PC board normal? (12V DC or 5V DC)
YES
Is 220/240V AC supplied to the primary side of the power source transformer?
NO
Refer to above "Preliminary checks". Or there is a defect before the power transformer.
YES Refer to the figure below.
Is 12V AC supplied to the secondary side of the power transformer?
NO
Power transformer is defective.
Replace is power transformer or the PC board.
YES Refer to the figure below.
Microcomputer is defective.
Replace the PC board.



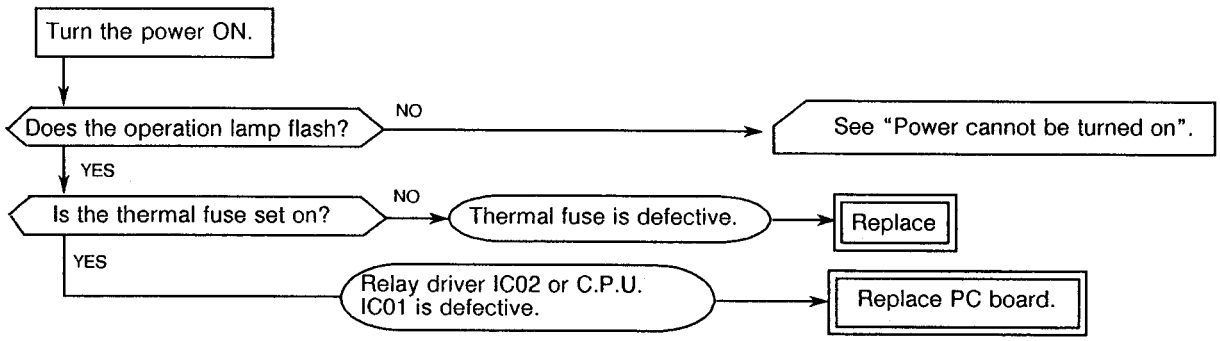
Power transformer connection diagram.

Color Identification

WHI:	WHITE
RED:	RED
YEL:	YELLOW
BLU:	BLUE

3.2 Power relay RY7 does not operate.

Louver is not controlled automatically.



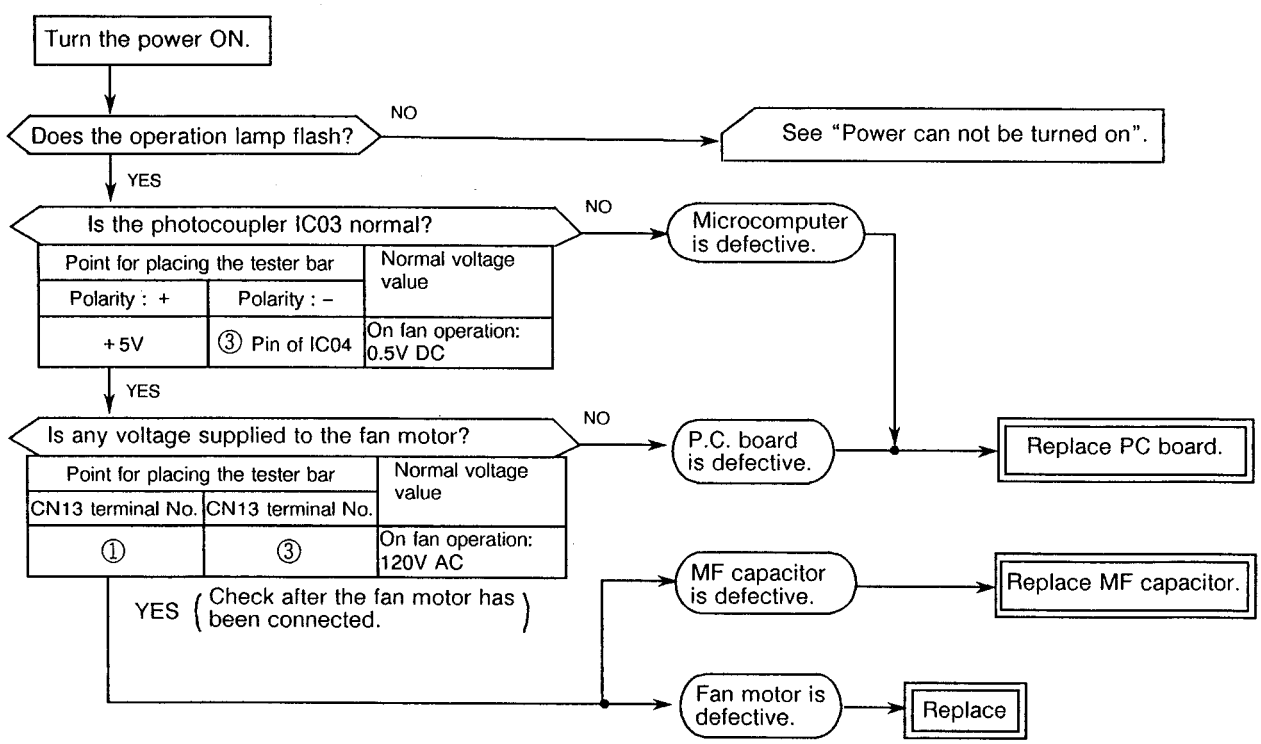
- When wiring to the thermal fuse has been broken, the timer lamp and operation lamp will flash with 5 Hz.

3.3 Only the indoor fan does not operate

<Preliminary checks>

Does it neither work in COOL or FAN ONLY operation?

<Checking procedure>



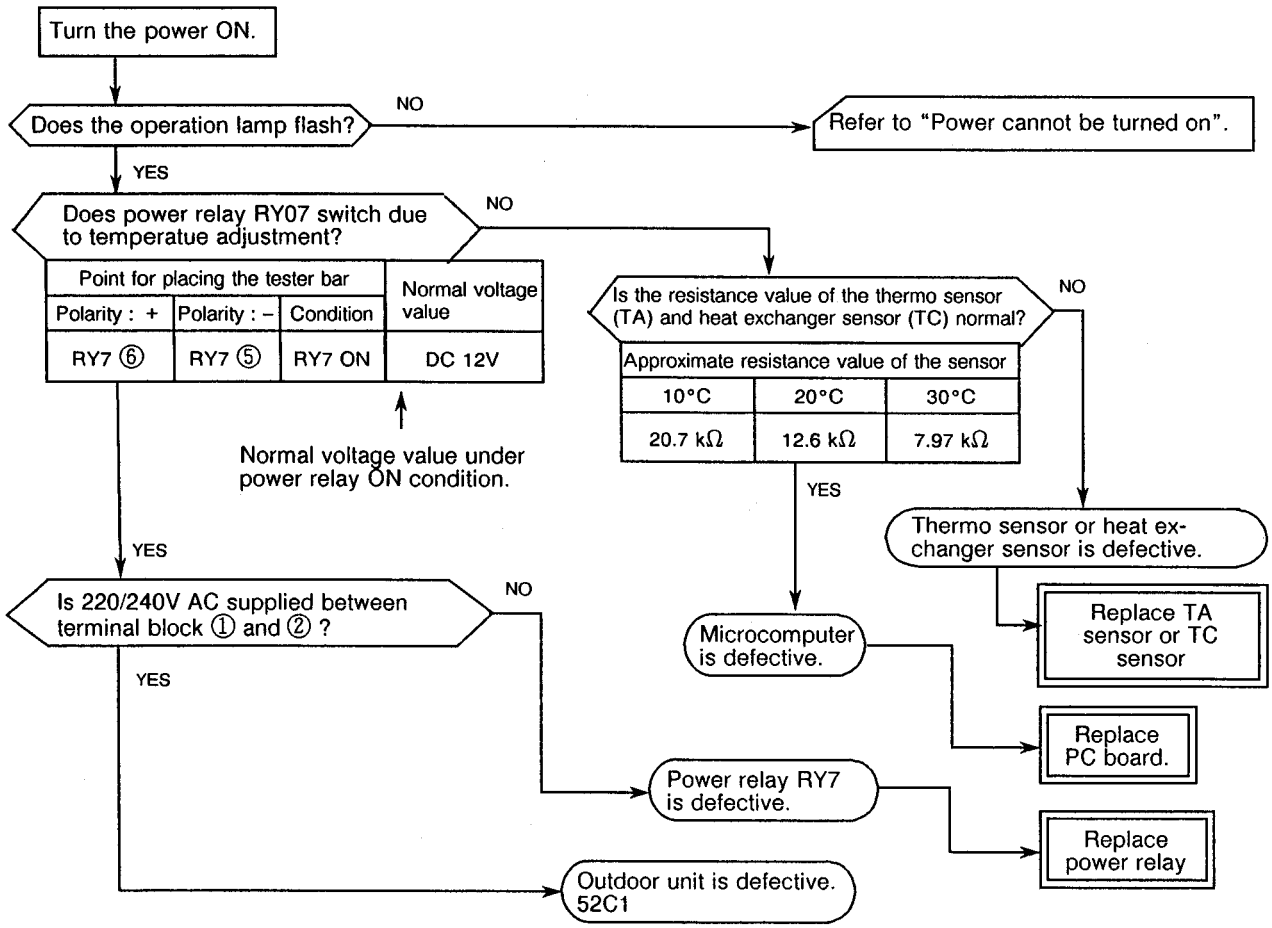
3.4 Compressor does not operate (Indoor fan also does not turn.)

< Preliminary checks >

① Is the temperature set on the remote control higher than the room temperature in cool operation?

② Is contact of the crossing wiring O.K.?

< Checking procedure >

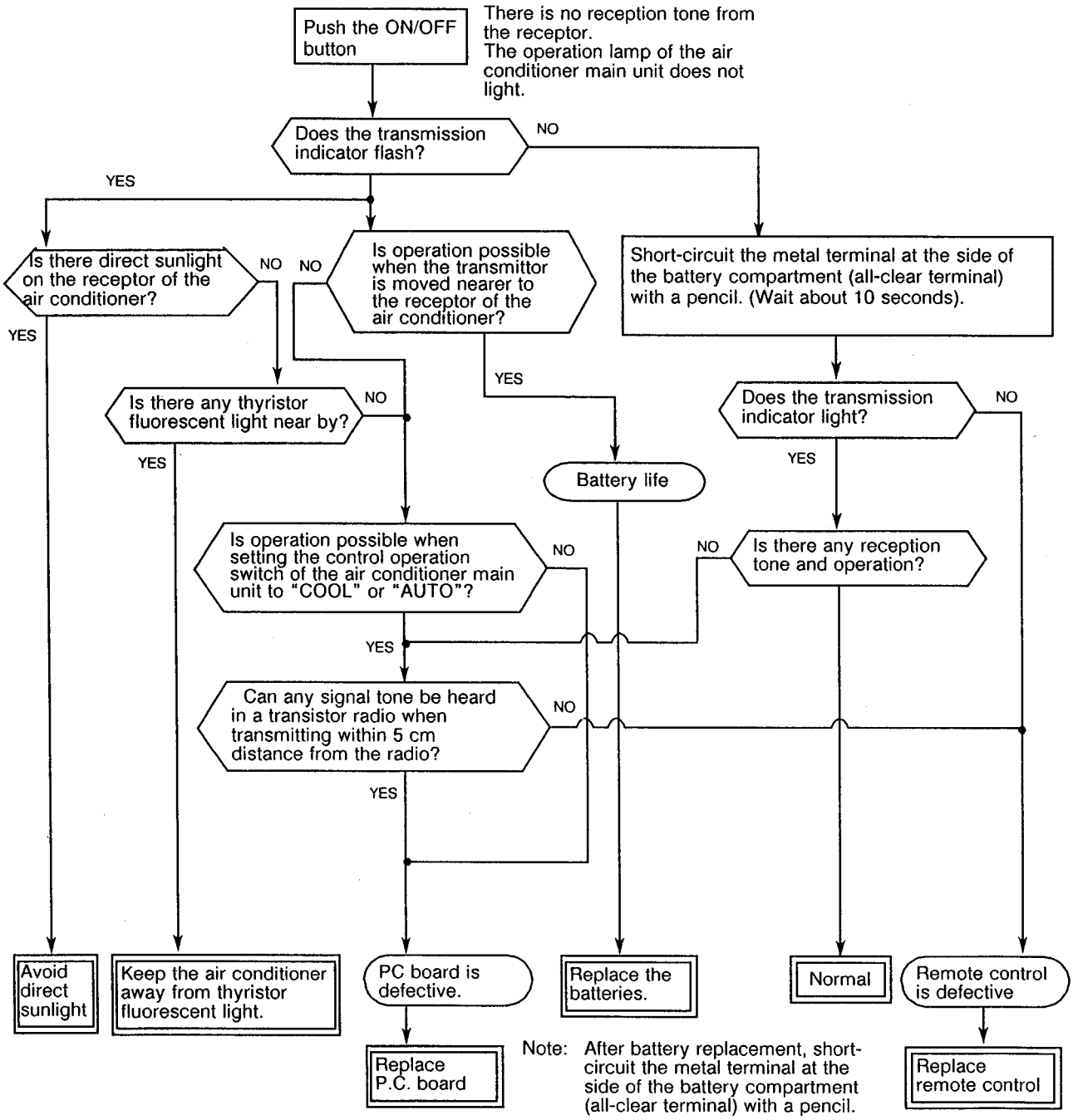


4. TEST POINTS ON THE PC BOARD AND LIST OF VOLTAGE VALUES

The test points (TP) are indicated on the rear of the PC board.
The voltage values on the test points for defect diagnosis items are listed below.

No.	Defect diagnosis item	Point for placing the tester bar			Normal voltage value
		Polarity (+)	Polarity (–)	Condition	
①	Does the power relay (RY7) switch?	RY7 ⑥	RY7 ⑤	When relay RY7 is ON.	12V DC (When relay is ON.)
②	Is the voltage of the secondary side of the transformer O.K.?	TP3	TP5	–	No load : 14±2V With load: 12±2V (Primary voltage is about 230V)
③	Is the voltage of the primary side of the transformer O.K.?	TP1	TP2	–	220/240V AC
④	Are both PTH terminals 5V AC or less?	Either end of PTH		–	5V AC or less : normal 5V AC or more: abnormal

5. HOW TO CHECK THE REMOTE CONTROL (INCLUDING THE INDOOR PC BOARD)


Push the ON/OFF button
There is no reception tone from the receptor.
The operation lamp of the air conditioner main unit does not light.
Does the transmission indicator flash?
NO
YES
Is there direct sunlight on the receptor of the air conditioner?
NO
YES
Is operation possible when the transmittor is moved nearer to the receptor of the air conditioner?
NO
YES
Short-circuit the metal terminal at the side of the battery compartment (all-clear terminal) with a pencil. (Wait about 10 seconds).
Is there any thyristor fluorescent light near by?
NO
YES
Battery life
Does the transmission indicator light?
NO
YES
Is operation possible when setting the control operation switch of the air conditioner main unit to "COOL" or "AUTO"?
NO
YES
Is there any reception tone and operation?
NO
Can any signal tone be heard in a transistor radio when transmitting within 5 cm distance from the radio?
NO
YES
Avoid direct sunlight
Keep the air conditioner away from thyristor fluorescent light.
PC board is defective.
Replace the batteries.
Normal
Remote control is defective
Replace P.C. board
Replace remote control
Note: After battery replacement, short-circuit the metal terminal at the side of the battery compartment (all-clear terminal) with a pencil.

5.1 HOW TO CHECK THE PC BOARD

5.1.1 Operating precautions

① When removing the front panel or the PC board, be sure to disconnect the power plug from the AC outlet.
② When removing the PC board, hold the edge of the PC board and do not apply force to the parts.
③ When connecting or disconnecting the connectors on the PC board, hold the whole housing. Do not pull at the lead wire.

5.1.2 Inspection procedures

① When a PC board is judged to be defective, check for disconnection, burning, or discoloration of the copper foil pattern or this PC board.
② The PC board consists of the following 4 parts:

1. Main PC board part..... power relay, indoor fan motor drive circuit and control circuit, C.P.U. and peripheral circuits, buzzer drive circuit and buzzer.
2. Light receiving unit..... light receiving circuit
3. Display ..... LED
4. Switch PC board ..... wireless-control, temporary switch

Check the defects of the PC board following the list below.
(Referring to Table-4)

5.1.3 Checking procedure

No.	Procedure	Check point (Symptom)	Trouble cause
①	Disconnect the power plug from the AC outlet and remove the PC board assembly from the electronic parts base. Remove the flat cable from the terminal plate.	Is the fuse blown?	① Application of shock voltage ② Short-circuit of the indoor fan motor
②	Remove the motor connector from "MOTOR". Turn the power ON. If the operation lamp flash (0.5 sec. ON, 0.5 sec. OFF), steps ①–③ in the right column are not necessary.	Check power supply voltage. ① Between CN01 ① and ③ (220/240V AC) ② Between CN02 ① and ③ (12V AC) ③ Between Q01 emitter and GND (5V DC) ④ Between Q03 emitter and GND (12V DC) ⑤ Between CN11 ① pin and GND (12V DC)	① Defective power cord, power switch, fuse or line filter, or wrong wiring ② Defective power transformer ③ Defective power circuit or short-circuited load ④ Same as ③ ⑤ Thermal fuse operation
③	Push the ON/OFF button once to set in operation mode. (Do not set to the fan only or on-timer mode.)	Check power supply voltage. ① Power relay coil voltage (12V DC) (RY7 ⑤,⑥) ② Between SL connectors 1 and 2	① Relay coil cable is broken, relay driver (IC181) is defective. ② Relay contact is defective, SL connector is defective.
④	Start operation by using the anti-restart timer.	① All LEDs of the operation lamp, the timer lamp and the FAN ONLY lamp light up. ② After 3 seconds, normal display does not appear.	Display is defective or defect in the 4P housing assembly.

No.	Procedure	Check point (Sympton)	Trouble cause
⑤	Push the ON/OFF button once to set in operation mode. 1. Setting the anti-restart timer 2. Cooling operation 3. Fan speed : AUTO 4. Set the temperature sufficiently lower than the room temperature. 5. Continuous operation	① The compressor does not operate. ② The operation lamp flashes.	① The temperature of the Indoor heat exchange unit is extremely low. ② Defective control PC board.
⑥	Connect the motor connector to "MOTOR" and turn the power ON. Start operation as follows: 1. Set the operation mode to "FAN ONLY". 2. Set the fan speed to "HIGH". 3. Continuous operation	① There is a voltage of 120V or more between the red and black motor connector leads. ② The motor does not rotate. (But the key operation of the remote control is accepted.) ③ Motor rotates but vibrates hard.	① Indoor fan motor is defective. ② Contact of the motor connector is defective. ③ Main PC board is defective.

Approximate value of the sensor (thermistor) resistance (TA, TC)

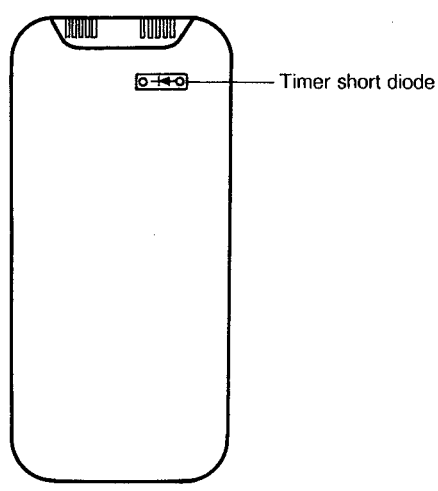
(≒ kΩ)

Sensor \ Temperature	0°C	10°C	20°C	30°C
Thermo Sensor	35.8	20.7	12.6	7.97

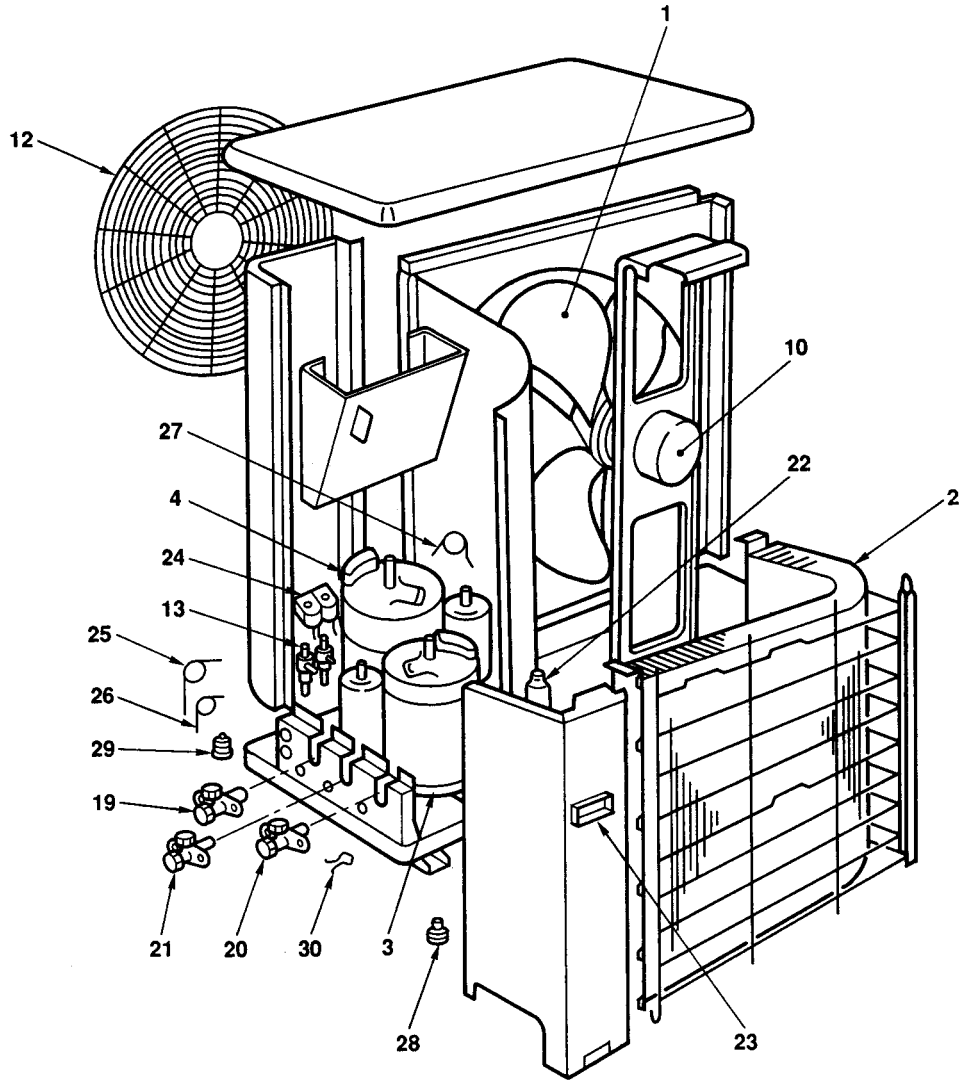
5.2 How to reduce the operation time of the anti-restart timer

- Drill 2 holes on the rear of the wireless remote control unit.
  Attach the diode (IS1555 or equivalent) to the rivet inside the unit.
- Push the ON/OFF button to start operation with the diode attached.
  During operation, push the transmission/check button while the diode is attached.

Wireless remote controller

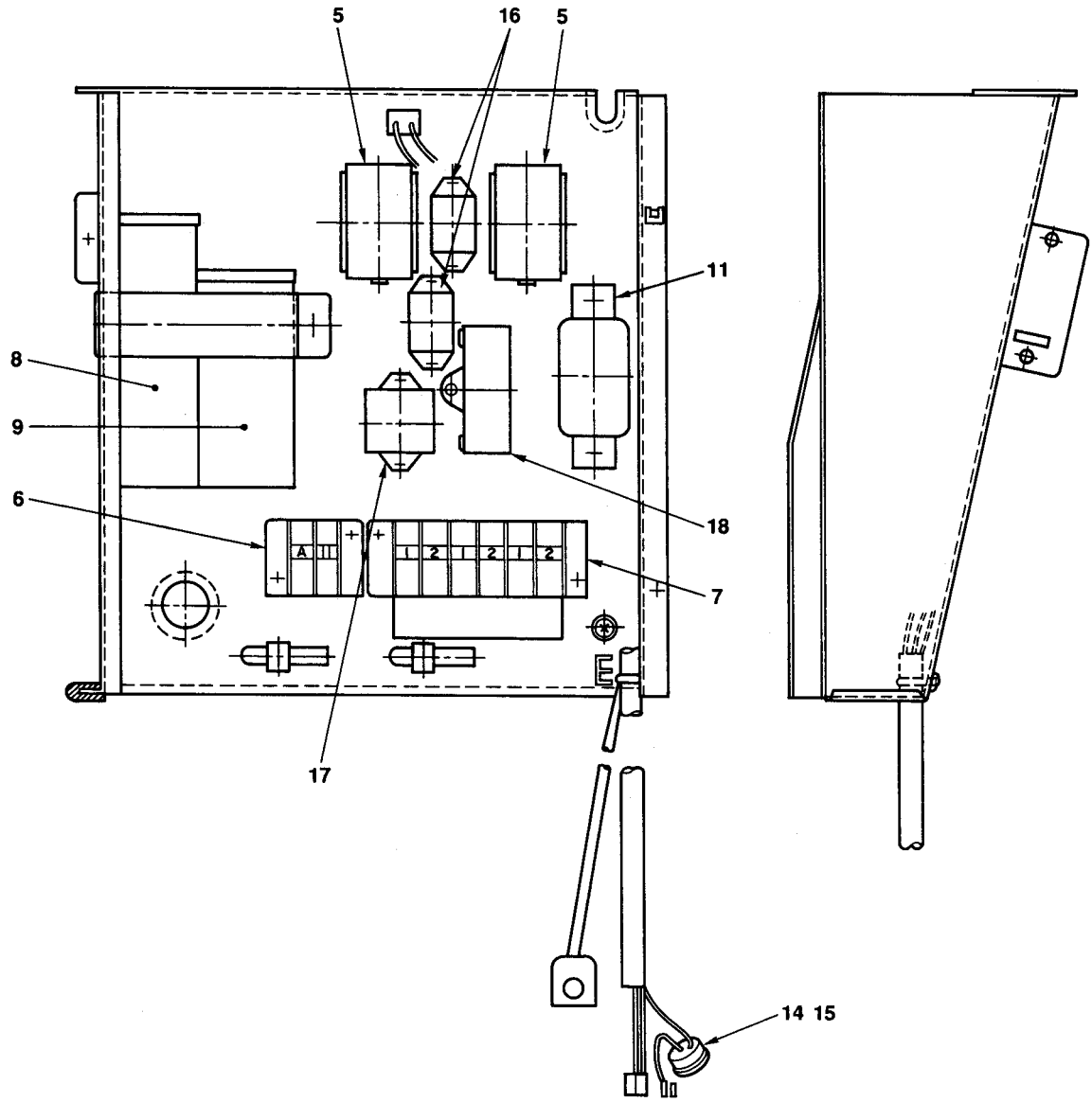


10. EXPLODED VIEWS AND PARTS LIST



Location No.	Part No.	Description
1	43120168	Fan, Propeller
2	43143657	Condenser
3	43141005	Compressor, PH94X1-4C3
4	43141100	Compressor, PH150X2-4L
10	43121519	Motor, AC, 200V, 50Hz, Fan
12	43191315	Guard-Fan
13	43046270	2-Way Valve
19	43046229	Packed Valve, 3/8" (9.5)
20	43046232	Packed Valve, 1/2" (12.7)
21	43046228	Packed Valve, 1/4" (6.4)
22	37544707	Dryer

Location No.	Part No.	Description
23	43119390	Hanger
24	43046198	Coil, 2-Way Valve
25	43047492	Capillary Tube, 1.7DIA
26	43047491	Capillary Tube, 1.5DIA
27	43047527	Capillary Tube, 2.0DIA
28	43049643	Rubber Cushion for Comp. PH94X1-4C3
29	43049625	Rubber Cushion for Comp. PH150X2-4L
30	43069988	Holder, OL-Relay



Location No.	Part No.	Description
5	43154139	Magnetic Switch
6	43060774	Terminal, Block
7	43160439	Terminal, Block, 6P
8	43055354	Capacitor, Plastic Film, 35MFD, 400V for Comp. PH150X2-4L
9	43055427	Capacitor, Electrolytic, 15MFD, 400V for Comp. PH94X1-4C3
11	43051259	Timer, Thermal

Location No.	Part No.	Description
14	43154155	Relay, Overload for Comp. PH150X2-4L
15	43150138	Relay, Overload for Comp. PH94X1-4C3
16	43154141	Relay, LY2F-L
17	43154135	Relay
18	43155084	Capacitor, Electrolytic, 3.5 MFD, 400V